University of Colorado at Boulder

FINAL REPORT TO NASA (Grant NAG 5-1242, CU#153-3213) Nov.90

Title: Discovery of Infrared/Radio Quiet Supernova Remnants (ADP)

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In collaboration with J. M. Shull and J. M. Saken (CASA), and J. Nichols-Bohlin (Goddard/CSC), a survey of the galactic plane has been conducted looking at the locations of suspected 'young' pulsars (ages less than 10^{6} years for evidence of old supernova remnants (SNRs). The IRAS Skyflux images were examined in the regions around 25 candidate young pulsars using temperature-sensitive flux ratio images. We have, in parallel, conducted a complete study of 164 galactic SNRs, detecting roughly 25\% of the sample.

Our search for old SNRs around young, isolated pulsars, failed to find any good new SNRs candidates from a carful examination of the IRAS images over those already know from nonthermal radio studies. The problem of SNR detection in the IR are mainly due to galactic plane source confusion on large scales at the long wavelengths. For example, SNRs have structures that can resemble the galactic cirrus emission structures, making it difficult to positively identify highly evolved remnants.

However, in the course of this study, an old SNR was identified associated with the Wolf-Rayet star HD 96548 (Nichols-Bohlin and Fesen 1990, Ap. J. 353, 281). This old remnant, seen only in the infrared and not in any published radio map, lies nearly centered on and completely surrounds the WR star. This finding is quite significant for two reasons: 1) it demonstrated that old remnants that fade below detectable radio flux limits for easy detection can, nonetheless, be fairly bright and easily detectable in the IR due to the large mass of warm interstellar dust within the remnant's massive shell. This newly discovered IR SNR, along with the discovery of the IR shell associated with the peculiar remnant, CTB 80 (Fesen, Shull, and Saken 1988, Nature, 334, 229), strongly indicate that the oldest remnants are most detectable in the IR and the IRAS images provide a useful data set to discover these. However, our search also shows that finding these highly evolved SNRs, many of which may be associated with pulsar formation, is quite difficult.